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CLAIMS

1. A storage system for use in a computer system including a host computer, the storage system comprising:
 - at least one storage device having a plurality of user-accessible storage locations, the at least one storage device including at least one disk drive;
 - a cache memory; and
 - at least one controller, coupled to the cache memory and the at least one storage device, that controls access to the at least one storage device from the host computer, so that the at least one storage device is accessible to the host computer only via the at least one controller, the at least one controller being capable of generating data that is independent of any data passed from the host computer to the storage system and writing at least some of the generated data to at least two non-contiguous user-accessible storage locations on the at least one storage device in response to a communication from the host computer that does not include the at least some of the generated data to be written to the at least two non-contiguous user-accessible storage locations, without writing any of the generated data to at least one user-accessible storage location disposed between the at least two non-contiguous storage locations so that any data in the at least one user-accessible storage location is preserved, and wherein the at least one controller is configured to write at least some of the generated data to the cache memory.
2. The storage system of claim 1, wherein the at least one controller is capable of generating the data that is independent of any data passed from the host computer to the storage system and writing the at least some of the generated data to the at least two non-contiguous user-accessible storage locations in response to a single command.
3. The storage system of claim 2, wherein the at least one controller is capable of generating the data that is independent of any data passed from the host computer to the storage system having a predetermined state and writing the at least some of the generated data having the predetermined state to each of the at least two non-contiguous user-accessible storage locations in response to the single command.

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4. The storage system of claim 2, wherein the at least one storage device includes a plurality of disk drives, wherein the at least two non-contiguous user-accessible storage locations are perceived by the host computer to be non-contiguous storage locations on different disk drives, and wherein the at least one controller is capable of writing the at least some of the generated data to each of the at least two non-contiguous user-accessible storage locations in response to a single command.

5. The storage system of claim 4, wherein the at least one controller is capable of writing the at least some of the generated data to only each of the at least two non-contiguous user-accessible storage locations in response to the single command.

6. The storage system of claim 2, wherein the at least one storage device includes a plurality of disk drives, wherein the at least two non-contiguous user-accessible storage locations are on different disk drives, and wherein the at least one controller is capable of writing the at least some of the generated data to each of the at least two non-contiguous user-accessible storage locations in response to the single command.

7. The storage system of claim 4, wherein the single command separately identifies the at least two non-contiguous user-accessible storage locations.

8. The storage system of claim 1, wherein the at least two non-contiguous user-accessible storage locations correspond to a logical object defined by the computer system, and wherein the controller is capable of writing the at least some of the generated data to each user-accessible storage location corresponding to the logical object in response to the single command.

9. The storage system of claim 8, wherein the at least one controller is capable of generating the data that is independent of any data passed from the host computer to the storage system having a predetermined state and writing the at least some of the generated data having

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the predetermined state to each user-accessible storage location corresponding to the logical object in response to the single command.

10. The storage system of claim 1, wherein the at least one controller includes means for generating the data that is independent of any data passed from the host computer to the storage system.

11. The storage system of claim 1, wherein the at least one storage device includes a plurality of disk drives.

12. A method of operating a storage system in a computer system including the storage system and a host computer coupled thereto, wherein the storage system includes a controller, a cache memory, and at least one storage device having a plurality of user-accessible storage locations, the at least one storage device including at least one disk drive, and wherein the controller controls access to the at least one storage device so that the at least one storage device is accessible to the host computer only via the controller, the method comprising, in response to a communication received from the host computer, acts of:

(A) generating, within the storage system, data that is independent of any data passed from the host computer to the storage system to be written to at least two non-contiguous user-accessible storage locations of the plurality of user-accessible storage locations on the at least one storage device;

(B) writing at least some of the generated data to the at least two non-contiguous user-accessible storage locations without writing any of the generated data to at least one user-accessible storage location disposed between the at least two non-contiguous storage locations so that any data in the at least one user-accessible storage location is preserved; and

(C) writing at least some of the generated data to the cache memory.

13. The method of claim 12, wherein the act (B) includes an act of writing the at least some of the generated data to the at least two non-contiguous user-accessible storage locations in response to a single command received from the host computer.

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14. The method of claim 13, wherein the act (A) includes an act of generating the data that is independent of any data passed from the host computer to the storage system having a predetermined state to be written to each of the at least two non-contiguous user-accessible storage locations in response to the single command received from the host computer.

15. The method of claim 13, wherein the at least one storage device includes a plurality of disk drives, wherein the at least two non-contiguous user-accessible storage locations are perceived by the host computer to be non-contiguous storage locations on different disk drives, and wherein the act (B) includes an act of writing the at least some of the generated data to each of the at least two non-contiguous user-accessible storage locations in response to the single command received from the host computer.

16. The method of claim 15, wherein the act (B) includes an act of writing the at least some of the generated data to only each of the at least two non-contiguous user-accessible storage locations in response to the single command received from the host computer.

17. The method of claim 13, wherein the at least one storage device includes a plurality of disk drives, wherein the at least two non-contiguous user-accessible storage locations are on different disk drives, and wherein the act (B) includes an act of writing the at least some of the generated data to each of the at least two non-contiguous user-accessible storage locations in response to the single command received from the host computer.

18. The method of claim 15, wherein the single command separately identifies the at least two non-contiguous user-accessible storage locations.

19. The method of claim 12, wherein the at least two non-contiguous user-accessible storage locations correspond to a logical object defined by the computer system, and wherein the act (B) includes an act of writing the at least some of the generated data to each user-accessible

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storage location corresponding to the logical object in response to a single command received from the host computer.

20. The method of claim 19, wherein the act (A) includes an act of generating the data that is independent of any data passed from the host computer to the storage system having a predetermined state to be written to the first group in response to the single command.

21. In a computer system including a storage system and a host computer coupled thereto, the storage system including, a controller, a cache memory, and at least one storage device, wherein the controller controls access to the at least one storage device so that the at least one storage device is accessible to the host computer only via the controller, a method of writing information to a logical object of the host computer, the method comprising, in response to a communication received from the host computer, acts of:

- (A) generating, within the storage system, data that is independent of any data passed from the host computer to the storage system to be written to a plurality of storage locations on the at least one storage device corresponding to the logical object of the host computer;
- (B) writing at least some of the generated data to only the plurality of storage locations corresponding to the logical object; and
- (C) writing at least some of the generated data to the cache memory.

22. The storage system of claim 1, wherein the at least one controller includes means, responsive to the communication, for generating the data independently of any data passed from the host computer to the storage system.

23. The storage system of claim 6, wherein the at least one controller is capable of writing the at least some of the generated data to only the at least two non-contiguous user-accessible storage locations in response to the single command received from the host computer.

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24. The storage system of claim 8, wherein the at least one controller is capable of writing the at least some of the generated data to only those user-accessible storage locations corresponding to the logical object in response to the single command.

25. The method of claim 17, wherein the act (B) includes an act of writing the at least some of the generated data to only the at least two non-contiguous user-accessible storage locations in response to the single command received from the host computer.

26. The method of claims 19, wherein the act (B) includes an act of writing the at least some of the generated data to only those user accessible storage locations corresponding to the logical object in response to the single command received from the host computer.

27. The method of claim 21, further comprising an act of mapping the logical object on the host computer to the plurality of storage locations on the at least one storage device corresponding to the logical object.

28. In a computer system including a storage system and a host computer coupled thereto, the storage system including a controller, a cache memory, and at least one storage device having a plurality of storage locations, wherein the controller controls access to the at least one storage device so that the at least one storage device is accessible to the host computer only via the controller, a method of writing information to a logical object of the host computer, comprising acts of:

mapping the logical object to at least one storage location of the plurality of storage locations on the at least one storage device that is assigned to store the information for the logical object;

receiving, at the storage system, a communication from the host computer identifying the at least one storage location;

generating, within the storage system, data that is independent of any data passed from the host computer to the storage system and writing at least some of the generated data to the at least one storage location in response to the act of receiving the communication; and

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writing at least some of the generated data to the cache memory.

29. The method of claim 28, wherein the host computer includes at least one mapping layer, and wherein the act of mapping includes an act of mapping the logical object through the at least one mapping layer on the host computer to the at least one storage location on the at least one storage device.

30. The method of claim 29, wherein the at least one mapping layer includes a plurality of mapping layers including at least one of a file system mapping layer, a logical volume mapping layer, and a database mapping layer, and wherein the act of mapping includes an act of mapping the logical object through at least one of the file system mapping layer, the logical volume mapping layer, and the database mapping layer on the host computer to the at least one storage location on the at least one storage device.

31. (Cancelled)

32. The method of claim 28, wherein the storage system includes a storage system mapping layer, and wherein the act of mapping includes an act of mapping the logical object through the storage system mapping layer to the at least one storage location on the at least one storage device.

33. The method of claim 28, wherein the at least one storage location includes a group of storage locations on the at least one storage device, each storage location of the group of storage locations being assigned to store the information for the logical object, and wherein the act of mapping includes an act of mapping the logical object of the host computer to each storage location of the group of storage locations on the at least one storage device.

34. The method of claim 33, wherein the act of receiving includes an act of receiving, at the storage system, a communication from the host computer identifying each storage location

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of the group of storage locations on the at least one storage device that is assigned to store the information for the logical object.

35. The method of claim 34, wherein the act of generating and writing includes an act of generating data and writing the at least some of the generated data to each storage location of the group of storage locations on the at least one storage device that is assigned to store the information for the logical object.

36. The method of claim 35, wherein the act of generating and writing includes an act of generating data and writing the at least some of the generated data to only the group of storage locations on the at least one storage device that are assigned to store the information for the logical object.

37. The method of claim 35, wherein at least two storage locations of the group of storage locations are perceived by the host computer to be non-contiguous storage locations on the at least one storage device.

38. The method of claim 35, wherein the at least one storage device includes a plurality of storage devices, and wherein at least two storage locations of the group of storage locations are perceived by the host computer as being located on different storage devices.

39. The method of claim 35, wherein the at least one storage device includes a plurality of disk drives, and wherein at least two storage locations of the group of storage locations are located on different disk drives.

40. The method of claim 35, wherein the at least one storage device includes a first disk drive, and wherein at least two storage locations of the group of storage locations are non-contiguous storage locations on the first disk drive.

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41. The method of claim 28, wherein the act of mapping is performed on the host computer.

42. The method of claim 28, wherein the at least one storage location includes a group of storage locations on the at least one storage device, each storage location of the group of storage locations being assigned to store the information for the logical object, and wherein the act of receiving includes an act of receiving, at the storage system, a communication from the host computer identifying each storage location of the group of storage locations on the at least one storage device that is assigned to store the information for the logical object.

43. The method of claim 28, wherein the at least one storage location includes a group of storage locations on the at least one storage device, each storage location of the group of storage locations being assigned to store the information for the logical object, and wherein the act of generating and writing includes an act of generating data and writing the at least some of the generated data to each storage location of the group of storage locations on the at least one storage device that is assigned to store the information for the logical object.

44. The method of claim 43, wherein the act of generating and writing includes an act of generating data and writing the at least some of the generated data to only the group of storage locations on the at least one storage device that are assigned to store the information for the logical object.

45. The method of claim 43, wherein at least two storage locations of the group of storage locations are perceived by the host computer to be non-contiguous storage locations on the at least one storage device.

46. The method of claim 43, wherein the at least one storage device includes a plurality of storage devices, and wherein at least two storage locations of the group of storage locations are perceived by the host computer as being located on different storage devices.

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47. The method of claim 43, wherein the at least one storage device includes a plurality of disk drives, and wherein at least two storage locations of the group of storage locations are located on different disk drives.

48. The method of claim 43, wherein the at least one storage device includes a first disk drive, and wherein at least two storage locations of the group of storage locations are non-contiguous storage locations on the first disk drive.

49. The method of claim 28, wherein the act of generating and writing includes an act of generating data having a predetermined state and writing the at least some of the generated data having the predetermined state to the at least one storage location on the at least one storage device.

50. The storage system of claim 1, wherein the at least one controller destages the at least some of the generated data from the cache memory to the at least one storage device so that the generated data is written to the at least two non-contiguous user-accessible storage locations via the cache memory.

51. The method of claim 12, wherein the act (B) further comprises an act of destaging the at least some of the generated data from the cache memory to the at least one storage device so that the generated data is written to the at least two non-contiguous user-accessible storage locations via the cache.

52. The method of claim 21, wherein the act (B) further comprises an act of destaging the at least some of the generated data from the cache memory to the at least one storage device so that the at least some of the generated data is written only to a plurality of storage locations on the at least one device via the cache.

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53. (New) The method of claim 28, wherein the act of generating and writing further comprises an act of destaging the at least some of the generated data from the cache memory to the at least one storage device.

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 LOGICAL OBJECTS IN A DATA STORAGE SYSTEM

Examiner: Woo Choi
Art Unit: 2186

CERTIFICATE OF FACSIMILE TRANSMISSION 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document is being transmitted via facsimile to the attention of Examiner Woo Choi FAX number 703-746-9109, at the United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450, in accordance with 37 C.F.R. §1.6(d), on the 2nd day of September, 2004.

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PROPOSED CLAIM AMENDMENTS

Sir:

This paper is submitted to propose claim amendments in response to a telephone conversation initiated by the Examiner to Applicants' representative on August 20th 2004. During the telephone conversation, the substance of which is summarized herein, the Examiner indicated that he would allow the application if the claims were amended to indicate that data generated by the storage system is written to the cache memory. Applicants have proposed amendments to this effect and request that these amendments be entered by Examiner's Amendment. Proposed amendments to claims 1-6, 8-10, 12, 13, 15, 16, 17, 19, 21-26, 28, 35, 36, 43, 44, and 49 are submitted herein and proposed new claims 50-53 are also submitted.

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